Invertebrata

Tasmania's Invertebrate Newsletter

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Invertebrata is produced by the Queen Victoria Museum and Art Gallery, Launceston, Tasmania.

We publish articles and short notes on all aspects of invertebrate biology and conservation in Tasmania.

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The Southern Rock Lobster Recruitment Monitoring Program

Southern rock lobsters (*Jasus edwardsii*) are taken around Tasmania by both recreational and commercial fishers. The rock lobster fishery is the second most valuable one in the state after the abalone fishery, and is probably the most important one in terms of its contribution to local economies. Fishery data collected since the 1960s indicate that the resource is overexploited, especially in northern and eastern Tasmania. Overexploitation is a problem for several reasons: it reduces the economic efficiency of the industry, it reduces the economic yield from each lobster, and in extreme situations there is potential for recruitment failure. Recruitment failure has occurred in other rock lobster fisheries (e.g. in Hawaii), and this is a realistic concern for the Tasmanian resource.

Concern over the risk of recruitment failure prompted the Department of Primary Industry and Fisheries in the late 1980s to investigate methods for monitoring recruitment of rock lobsters. The aim was to develop techniques for catching the puerulus stage in the rock lobster's life cycle. This stage is transitional between the planktonic phyllosoma stages (ca.12 instars over 12-18 months), which are found beyond the continental shelf, and the benthic juvenile stages found inshore. The preliminary project evaluated a range of collector designs and methods for deployment. The project concluded that the most appropriate system for catching newly recruited rock lobsters was the Booth collector, designed in New Zealand.

Booth collectors are made from sheets of plywood so that narrow gaps are formed. On seasoned collectors these gaps simulate natural reef crevices, and puerulus will settle on the collectors and moult through to juvenile lobsters. Groups of collectors have been deployed at six sites around Tasmania and are serviced monthly to obtain a relative index of puerulus abundance.

Seven years of data have now been collected, and we are reaching the stage where we have sufficient baseline information to detect declines in settlement. Some interesting patterns have been detected, such as seasonal and regional variation in settlement, and these are likely to linked to patterns in oceanography. Elaborating these links is an important offshoot of the program. For instance, in 1997 puerulus settlement seemed to be delayed by two months. We think this may have resulted from a relatively slow retreat of the Eastern Australian Current, which normally moves north during winter (hence the relatively warm 1997 winter). Last October we also noticed puerulus of a different species for the first time. The new species is probably the eastern rock lobster, found in New South Wales, but the identification is yet to be confirmed.

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Correction

Please note the following correction for the article on the Paper Nautilus by Liz Turner in the last *Invertebrata*, No. 9, p. 6:

In the last paragraph, the section beginning '*Although...*' should read '*Although nautilus and argonaut animals are not closely related, the nautilus shell is similar in size and shape to the Paper Nautilus "shell". One of the aims of the display is to demonstrate that only nautilus animals have a true molluscan 3-layered shell, and that it is the argonaut egg-case which is known as the Paper Nautilus.*'

Apologies to Liz Turner for the error in editing. — Ed.

Editorial

The Australian Museum in Sydney was the venue in December for 'The Other 99%', the third Australian bi-annual conference on invertebrate conservation and biodiversity. The conference covered a very wide range of topics but emphasised 'getting invertebrates on the public agenda.' Tasmania was well-represented: 15 participants, nine of whom nine presented either a paper or a poster. Proceedings of the conference will be published as a special issue of *Australian Zoologist*.

Two statistical matters came up at the meeting which are worth knowing about. The first is 'sample coverage', the basis of a new set of methods which allows you to estimate, for example, the total number of species at a given site.

Sampling a site typically gives you a species list on which a few species are very well represented and many of the rest are very rare: one or two specimens each. A second sample might give you a new list with some of the rare species missing, but with new rare ones taking their place. Can you estimate the total number of species, recorded and not-yet-recorded, from the results of a series of such samples? Yes, and the statistical package you need is available free on the Internet. It's called 'EstimateS' and you can find the package and the developer, Robert Colwell, at the 'Estimates' Website: **http://viceroy.eeb.uconn.edu/estimates**.

'EstimateS' also contains other tools of use in analysing biodiversity, including a randomiser for species accumulation curves. This program generates a curve from random grabs of your samples, ignoring the actual order in which you took them.

The second statistical matter also has to do with sampling. Barry Richardson (University of Western Sydney) presented a remarkable paper on high-intensity sampling of canopy insects in a small woodland near Richmond, NSW. Variability from place to place within the woodland, from tree to tree and within a single tree was very high. Existing sampling protocols and analytical methods were barely adequate to deal with the observed variation. Richardson estimates that at least 22 carefully matched replicates would be required to detect a 10% change in species richness in the woodland. Designers of studies aimed at prioritising sites for invertebrate conservation, and of 'before and after' impact surveys, should heed the lesson: Nature can be more variable than you expect.

Invertebrate Calendar

(This is the place for notices of conferences and meetings, lectures and seminars, birthdays and anniversaries, annual mating swarms, etc. The absolutely final Calendar deadline for the July 1998 Invertebrata *is Friday, 26 June.)*

16-18 March 1998 – Aquatic Ecology Postgraduate Workshop at the Queens-cliff Marine Station, near Melbourne. A bargain at $85 for tuition, food and accomodation! For information on the 1997 workshop and links to other Websites see **www.arts.unimelb.edu.au/Dept/Geography/aepgw/aepgwhome.html**, or contact Mike Holloway, Department of Zoology, University of Melbourne, Parkville VIC 3052, phone (03) 9344 4334, fax (03) 9344 7909.

March–May 1998 – Gossamer season! The 1997 autumn saw big 'flights' and 'falls' of spider silk around Tasmania, especially in the Northern Midlands. Watch for gossamer on clear, fairly still days, and report exceptional occurrences to *Invertebrata*!

The Department of Zoology at the University of Tasmania (Hobart) offers free public seminars on Wednesdays at 1 pm in Lecture Theatre 2 of the Life Sciences Building. Speakers range from Honours students to high-powered academic visitors. The schedule for semester 1 (to 24 June) is firming up, so for details of speakers and topics contact either Assoc. Prof. Roy Swain, (03) 6226 2610, or Departmental Secretary Sherrin Bowden, (03) 6226 2613. Check out, too, the Department's Website: **www.utas.edu.au/docs/zoology/homepage.html**.

Insect Netting

Some interesting entomological sites currently on-line are...

Bugs: Cultural Entomology
www.insects.org
Dead Bugs in Amber Club
http://members.tripod.com/~Snakefly/
The Radar Entomology Web Site
http://usda_apmru.tamu.edu/trews/ww_re_hp.htm
Iowa State University's Tasty Insect Recipes
www.ent.iastate.edu/Misc/InsectsAsFood.html
Forensic Entomology
www.uio.no/~mostarke/forens_ent/forensic_entomology.html

...and don't miss the big link site, *Insects on WWW*, maintained by Jun Fan of the Virginia Tech Department of Entomology at Blacksburg, Virginia:
www.isis.vt.edu/~fanjun/text/Links.html

Bumble Bees

I would be interested to hear from anyone in north, northeast and northwest Tasmania about sightings of Bumble Bees in their areas, including any information on what plants the bees visit, and on what dates the bees were seen.

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What has the Threatened Species Unit done for invertebrate conservation? ...I hear you say

Interestingly enough invertebrates, compared to vertebrates, in the Tasmanian threatened species world continue to be the main focus of my activity. And rightly so I hear you say. Perhaps the start of making sure invertebrates gained equal recognition with vertebrates was the production of the Interim List of Threatened Invertebrates by the Advisory Committee in 1994. This provided a ready-made list of species for immediate inclusion on the Tasmanian *Threatened Species Protection Act 1995*. A great start which other States have applauded. In 1997 during the Regional Forest Agreement process, 11 specific fauna projects were undertaken six of which were exclusively on invertebrates and comprised approximately $330 000 or 66 % of the entire fauna budget. They included a burrowing crayfish survey, decaying log fauna, aquatic invertebrate modelling, invertebrate bioregionalisation, giant lobster survey and cave fauna assessment. Since the Threatened Species Unit has been operating (about one and half years now – shock horror) we have increased our invertebrate projects from being just the Ptunarra brown butterfly to include *Astacopsis gouldi*, burrowing crayfish, cave fauna and stag beetles. The World Heritage Area has also picked up species projects like the pencil pine moth, Lake Pedder earthworm surveys, Ida Bay karst fauna and a study on honey bees. Nominations for threatened species listing, delisting or a change in status on the Tasmanian Act are now being made and already we have considered our first native marine sea star.

For on-ground work the Threatened Species Unit's input into the Forestry planning processes has reinforced that all forest-dwelling listed invertebrates are triggering increased prescriptions in the timber harvest process. These translate to increasing wildlife habitat strips, new priority areas, increasing streamside reserves and increasing the intensity of wildlife habitat clumps. In other habitats all environmental impact assessments now have to include invertebrate surveys and we have used the expertise of Alastair Richardson and Kevin Bonham from the University and others to make use of these opportunities to increase our survey sites and knowledge. Quite recently our recommendation for the *Astacopsis* fishing ban was instrumental in leading to the close of the fishery and that has and will spell all sorts of great conservation outcomes for the species. I was disappointed that our efforts were not acknowledged by the Deloraine Field Nats. [*See letter above. – Ed.*] We are currently looking at a regional planning process for the giant velvet worm with the intent of mapping land use activities throughout the species' entire range to ensure that plentiful native habitat remains intact and linked by corridors. It's a Parks and Forestry cooperative program.

This year's NHT applications include regional planning for stag beetles and all velvet worms, cave ecosystem management, *Astacopsis* education and monitoring program and an integrated aquatic invertebrate recovery program. It's just a start but considering the limited resources and staff available, compared to four years ago, it's not too bad.

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Letter to the Editor

The Tasmanian *Threatened Species Act Protection 1995* lists 110 invertebrates as a significant part of the 154 species of fauna presently considered threatened. So, how protected are our threatened invertebrates now that they have joined some of the flashy feathered and cuddly furred icons of conservation?

The Deloraine Field Naturalists (DFNG) have kept a watching brief on the Tasmanian Giant Freshwater Crayfish, *Astacopsis gouldi,* ever since we provided the fieldwork team for a study funded by Environment Australia. The species is listed as 'vulnerable' under the Commonwealth 1992 Endangered Species Act, and also the Tasmanian *Threatened Species Protection Act 1995*. A recently prepared Recovery Plan under the Regional Forest Agreement process recommends $2.4 million to bring the species into recovery. This Plan was carried out under the auspices of the Inland Fisheries Commission (IFC), and the field survey conducted failed to find a single legal-sized crayfish.

We were therefore disturbed to discover that the new 1997-98 fishing regulations still allow 3 legal-sized male crayfish to be taken daily. The only change is that the new code now has a diagram showing how to tell a male from a female. After we drew this to the attention of the Wildlife Service's Threatened Species Unit, they informed the IFC that they were not pleased, and the IFC Commissioner apparently gave an undertaking to eventually remove the allowable catch after 'consulting the stakeholders'. Meanwhile, our letter to the Minister for the Environment asking him to carry out his duty to protect the species went unanswered.

Our frustration with the situation led us to seek legal advice which concluded that it is most certainly an offence to take any listed fauna under section 51 of the 1995 State Act, and section 50 provides '*any licence, permit or other authority under any law which relates to the taking of fauna does not authorise the holder to take fauna in circumstances in which it would be prohibited under this Act*'. We were further advised that the Minister for Fisheries and the IFC in issuing licences, and the Minister for Environment and his Department for not properly protecting the species are in breach of the 1995 Act. We presently await their answer to this development.

This little illustration does not bode well for the protection of our threatened invertebrates. *A. gouldi* is the largest freshwater crayfish in the world, and arguably the largest freshwater invertebrate. Thus, it is a spectacular species capable of drawing attention to its plight of decline. If we can't properly protect an invertebrate species of this celebrity status, what hope for the rest?

Jim Nelson
Secretary, DFNG
20 October 1997

[*On 27 November 1997 the Hon. Peter Hodgman, the Minister for Environment & Land Management, announced that the* A. gouldi *recreational fishery would close from New Year's Eve 1998. – Ed.*]

A millipede name re-attached

Haplodesmid millipedes are widespread in Tasmania but rarely seen. Small colonies of haplodesmids live in very wet rotting wood, where they cluster together in slow-moving groups of 10–50. The adults are about 6mm long and golden-brown.

Under the microscope (Fig. 1, below), the second tergite on a haplodesmid (T2 in the illustration) is seen to extend outward and forward, partly concealing the head (H). All the tergites are covered with dozens of tiny bumps — an unusual feature in our millipede fauna.

Recently I sorted the Tasmanian haplodesmids to species, using gonopod structure as my sorting tool. Gonopods are modified legs in adult male millipedes. They're used to transfer sperm during mating, and they often have a very complicated structure. Gonopod structure is the usual (and sometimes the only) basis for separating one millipede species from another.

After I had made working sketches of the haplodesmid gonopods, I found to my delight that the gonopod of one of our species (Figs. 2A, 2B) matched the gonopod of *Asphalidesmus leae*, a 'bumpy', 6mm-long species described in 1910 and not recorded since.

The taxonomic placement of *Asphalidesmus*, with its one described species *A. leae*, has long been uncertain. The genus was created for a specimen collected by Arthur Lea, who was Tasmania's Government Entomologist at the turn of the century. Lea sent the specimen to the great Italian entomologist Filippo Silvestri, who published the species name, a description in Latin and an illustration of the gonopod (Fig. 2C). Not having seen the type specimen or any later collections, some millipede specialists have been inclined to place *Asphalidesmus* in the Dalodesmidae, which has more species in Tasmania than any other millipede family.

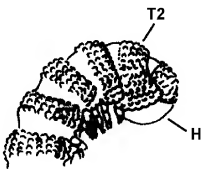

Fig. 1. Head end of a Tasmanian haplodesmid millipede.

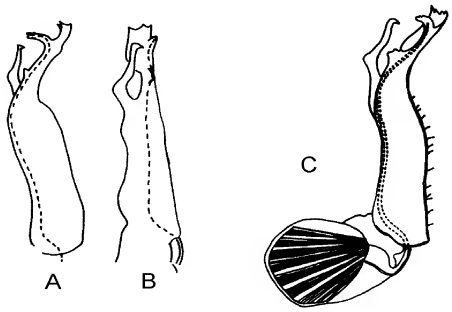

Fig. 2. Views of the left *Asphalidesmus leae* gonopod. The dashed and dotted lines show the course of the spermal channel. (A) and (B) are my working sketches showing the gonopod from two slightly different viewpoints. (C) is a tracing of an enlargement of the published illustration of Silvestri (1910; Fig. 8, p. 361). The gonopod is *ca.* 1/3 mm long and 2B is an anterior view (the spermal channel opens anteriorly).

It's now clear that *Asphalidesmus* belongs in the Haplodesmidae, a family redefined by the Dutch specialist C.A. W. Jeekel in 1984 to include a range of 'bumpy' millipedes with extended second tergites occurring in both the Northern and Southern Hemispheres. Our local log-dwelling forms look remarkably similar to *Phygoxerotes* species, which live in ant nests in southern Africa.

A second Tasmanian haplodesmid species was described in 1920, this time by the American myriapodologist Ralph Chamberlin from material supplied by G.H. Hardy. It isn't yet clear whether *Atopodesmus parvus* Chamberlin 1920 is the same as *Asphalidesmus leae* Silvestri 1910. Chamberlin didn't illustrate or describe the *A. parvus* gonopod, and the type specimens (if they still exist) are in the USA. Hardy's specimen locality was given as 'Tasmania', while Lea's was 'Hobart'. There is indeed a common haplodesmid in the Hobart area, but its gonopods are very different from those of *A. leae*.

The taxonomic jigsaw puzzle still needs work, but it's nice to know that a long-missing piece has been rediscovered!

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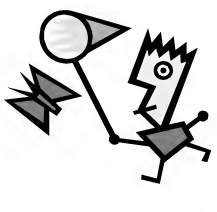
Reference:

Silvestri, F. 1910. Descrizioni preliminari di novi generi di Diplopodi. *Zoologischer Anzeiger* **35**: 357–364.

Wanted!

Regular reports of people news and invertebrate goings-on from the University of Tasmania, Parks and Wildlife Service, Inland Fisheries Commission, CSIRO Marine Labs and any other agencies or institutions studying invertebrates in Tasmania. News for the July *Invertebrata* can be e-mailed to the editor before the end of March: mesibov@southcom.com.au.



Coming toTasmania for a quick sweep?

A notice of your planned collecting trip in *Invertebrata* could put you in touch with local experts, enthusiasts and volunteer helpers. Local zoologists would also be interested to hear where you went and what you found!

News from the World Heritage Area Zoologist

Rare and threatened species

Two programs on threatened species were undertaken in the WHA this summer. One involved a survey of cave fauna in the Ida Bay karst area, and the other was a survey for the pencil pine moth, *Dirce aesiodora*.

Stefan Eberhard was employed to survey the Ida Bay Karst area, particularly Exit Cave, to identify areas within the cave with high conservation values for fauna and that require special protection from cave users by establishing fauna sanctuaries. Exit Cave is currently closed to public access but it will eventually be re-opened under controlled conditions. Part of the study focussed on searching for the blind cave beetle, *Goedetrechus mendumae* which is listed as 'vulnerable'. This species was previously only known from Keller's Squeeze in Exit Cave, but the current survey has shown that it occurs in Mystery Creek Cave as well as other parts of Exit Cave. It is thought to be well-distributed throughout the Ida Bay karst area but rarely observed within this range. Stefan has also developed an information sheet on cave fauna, including advice on minimising impacts on these animals; this will be available from the P&WS and also on the Internet.

Phil Bell was employed to survey the distribution of the Pencil Pine Moth. This moth is currently listed as 'vulnerable' on the Tasmanian *Threatened Species Protection Act 1995*. It was listed because it was only known from a handful of locations and its food plant, Pencil Pine (*Athrotaxis cupressoides*), is susceptible to fire and to the newly discovered alpine *Phytophthora*. Phil has found that this species is much more common than previously thought, being found in all Pencil Pine stands investigated throughout central and southern Tasmania. The larva of *D. aesiodora* was previously unknown. Phil has collected larvae from Pencil Pines which are likely to be the larvae of the moth and these are being reared by Peter McQuillan at the University of Tasmania. At this stage it appears likely that the Pencil Pine Moth lives for two years and it may be the only Australian geometrid with a two-year life cycle. The results of the survey will probably result in a delisting of the Pencil Pine Moth.

With the aid of many specialists, Mike Driessen has been compiling information on 13 rare and threatened invertebrates which occur in the WHA. The purpose of gathering this information is to identify management and research needs for each of these species with a view to funding programs over the next few years. As most of the WHA is comprised of national parks (92%), the fauna in most areas has the highest level of legal protection possible in Tasmania. However, there are management activities (e.g. habitat and fuel reduction burns), recreational activities (e.g. caving, illegal collecting), minor developments (e.g. tracks, huts, visitor centres) and feral species (e.g. wasps, bees, diseases) which have impacted or have potential to impact on invertebrate species with restricted distributions. If any reader has an interest in the species listed (see box) and would like to assist with preparation of action plans, please feel free to contact me.

Honey bees and leatherwood forest invertebrates

Stephen Mallick has commenced a PhD study investigating the impacts of commercial honey bees on the native flower-visiting fauna of Tasmania's leatherwood forests. Stephen is a student in the Department of Environmental Studies, University of Tasmania and is based at the Parks and Wildlife Service; the P&WS is also funding his research. Stephen is working in north-west Tasmania where the fauna of several sites with established commercial apiaries will be compared with fauna at control sites. In addition, the impact of introducing an apiary to 'pristine' sites without prior apiary use will be investigated. The results of this study should be of value in the ongoing debate as to the potential deleterious impacts of commercial apiaries within conservation areas in Tasmania. Stephen has almost completed his first survey during the leatherwood flowering season.

Fire and invertebrates

Penny Greenslade has recently completed a report on a preliminary investigation into the effect of fire in buttongrass moorland in southwest Tasmania. The report is based on a survey conducted in late summer 1996-97. Surface-living invertebrates were collected from 27 sites carrying buttongrass of different ages since fire. The sites formed a chronosequence ranging in age from one month to 64 years since the last fire. Highest numbers of species and individuals were found on sites of age between 10 and 19 years. There was a significant reduction in species richness and abundance on sites less than five years since fire. Groups such as Acarina, Collembolla, Coleoptera adults and Lepidoptera were affected. The study is part of an ongoing investigation into the effect of fire on fauna in the WHA.

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Threatened Invertebrates in the World Heritage Area

Annelida	
Diporochaeta pedderensis	Endangered
Arachnida	
Hickmanoxyomma cavaticum	Rare
Olgania excavata	Rare
Syncarida	
Allanaspides hickmani	Rare
Coleoptera	
Goedetrechus mendumae	Vulnerable
Idacarabus troglodytes	Rare
Lepidoptera	
Dirce aesiodora	Vulnerable
Fraus latistria	Rare
Oreixenica ptunarra	Vulnerable
Trichoptera	
Orphninotrichia maculata	Rare
Oxyethira mienica	Rare
Taskira mccubbini	Endangered
Taskiropsyche lacustris	Endangered

Sex and the Giant Squid

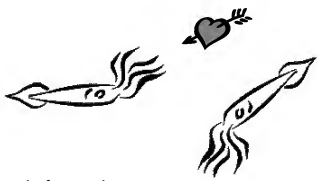
Late last year, our laboratory received three Giant Squid females that were captured in deep-sea trawls off Tasmania. Two were like most Giant Squid specimens that end up coming ashore, in that all the skin was stripped off. The third and largest specimen (220kg, 15m long) was different in that it retained the skin, which was coloured blood-red/maroon.

Squids and octopi store and transfer sperm in small, sealed, torpedo-shaped structures called spermatophores. In Giant Squids these are as thin as a matchstick and up to 20cm long. When we were dissecting our largest female, we found that a torn patch of skin on one lower arm had the coiled remains of a spermatophore. On the other lower arm we found a small hole with the remains of at least three sperm packets radiating up to 8-10cm around a small entry hole (<<1cm in diameter).

The big female, which could make calamari rings the size of truck tyres (even though the flesh is full of ammonia), was still submature! Like other squid and octopi which can store sperm for months, it seems that Giant Squids deal with their solitary lives by making the most of rare encounters with the opposite sex. Females appear to be storing sperm reserves in preparation for spawning (they are likely to only spawn once then die), rather than hoping a male will turn up when its time to release eggs.

The mechanism by which the males pass spermatophores to females appears to have analogies to rivet or nail guns. The male has a metre-long muscular penis and it appears that he uses this to 'inject' spermatophores under pressure into the skin of the female's arms. In some other squid species, much smaller than Giant Squids, males use scythe-like hooks to cut long wounds in the skin of the females. The males then implant sperm packets and the wounds heal over these stashes. How the females of these squids and Giant Squid later access the sperm stores is unknown; they may use their suckers or beak to peel open the stash or the sperm may migrate to the surface on hormonal cues.

We know very little about these monsters of the deep. There are still no observations of these animals in their natural habitats, let alone observations of mating behaviour. Most of the little we know has been gleaned from specimens trawled up from deep waters, but these are dead and often mashed up by the time they reach the surface. We may find out more as additional specimens come in, particularly now that commercial fishers are turning to deeper waters as shallow water fisheries start to collapse.



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More information:

Norman, M. and Lu, C.C. 1997. Giant squids and sex: first record of a mated female *Architeuthis*. *Nature* 389: 683-684.

Are snails bad for your health?

There was a brief but disturbing report on one of the TV news programmes of a young boy dying in Queensland from an untreatable parasitic disease after he had eaten a garden snail. The implication was that all suburban gardens had suddenly been turned into death-traps where your child could be struck down at any instant. While this is clearly not the case, the report has brought to the fore a previously little-known zoonosis of which all those dealing with public enquiries on invertebrates should be aware.

The parasite implicated in the report is the third-stage larva of the nematode *Angiostrongylus cantonensis* (rat lungworm). Developing larvae pass out in the rat's faeces to infect garden snails or slugs as intermediate hosts (the programme showed pictures of *Helix aspersa* but I am not sure what the full range of host species is). Some freshwater species of molluscs or Crustacea may also be implicated. Passage to man may be through contaminated uncooked vegetables, eg. lettuce, or by eating the intermediate host directly. Developing larvae migrate to the brain and meninges via the liver or lungs. These larvae can cause Eosinophilic Meningoencephalitis or Eosinophilic Meningitis. A full write-up of this condition can be found in *Synopsis of Zoonoses in Australia* (2nd ed.) by W.J. Stevenson and K.L. Hughes, published by AGPS.

Sequelae are uncommon and mortality is rare. Under 'control measures', the *Synopsis* says that molluscs and crustaceans should be adequately cooked and green vegetables thoroughly washed. Freezing foodstuffs at –15°C for 24 hours will destroy the lungworm larvae. Hands should be washed after work in areas where molluscs are present. Rat control should be instituted where cases occur and attention given to health education. While *A. cantonensis* is commonly regarded as a parasite of tropical and subtropical areas, its ability to survive cooler temperatures indicates that it may well be present, or if not present may become established, in more temperate areas of Australia.

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On the Beach

I have a friend who doesn't like beaches (they give him agoraphobia and he hates having sand between the toes) but there's no doubt that he's an exception. Our research assistant, Colin Shepherd, has recently completed one of Tasmanian zoology's more enviable jobs: visiting just about all the sandy beaches on the Tasmanian mainland and the major Bass Strait islands.

The excuse for this adventure was two years of funding from the late-lamented National Estate Grants Program which allowed us to survey the strandline fauna of Tasmania's beaches with a view to identifying beaches of high conservation value.

Why the strandline? Because (a) it is the most ecologically difficult zone on the beach, (b) it is largely ignored because it is intermediate between 'marine and terrestrial habitats, (c) it experiences the most pressure from human usage and (d) it is the easiest zone to sample, since it is available during any tidal cycle.

What's more, the strandline is biologically interesting. Because of its intermediate nature the animals must cope with very harsh conditions. The sand is unstable, baked by the sun, occasionally flooded by the sea and often drenched by rain. Primary production is rather limited from a small range of plants, but there may be an abundant, but unpredictable, supply of food in the form of kelp cast up by the sea. So the fauna needs pretty special adaptations.

The strandline is also highly vulnerable to disturbance. It is the place where human activity is likely to have the most severe effect as people walk, ride or drive along the shore, or as the hinterland is developed and access ways are made to beach. It is also vulnerable to colonisation by exotic plants through seeds and other propagules washing onto the shore.

The fauna that has colonised this difficult habitat is a mixture of the marine and the terrestrial. The fauna is almost entirely arthropodan, the marine component being represented by the crustaceans (crabs, sandhoppers and some isopods, though the latter may include woodlice of terrestrial origin). The terrestrial component is made up mostly of insects, but includes representatives of most arthropod groups.

Over two years Colin sampled 222 beaches using grouped pitfall traps in and around the tideline. The big beaches were sampled more than once, and in a sub-project we looked at variation along some of the longer beaches.

So what did we find? Well, you'll have to wait for the full story, because the data from the western beaches are still going into the computer. But an interesting trend from the east coast is that diversity seems to be linked to the diversity of the coastline, in terms of bays and promontories. And at the single-beach level we found some interesting exceptions to the general 'more insects at the top, more crustaceans at the bottom' rule of thumb. At least one of the sandhoppers is a specialist in the very highest zone of the strandline, living among the colonising plants and hardly visiting the kelp piles at all, and several of the insects (ants in the genera *Iridomyrmex*, *Myrmecia* and *Camponotus*, and a staphylinid beetle, *Cafius* sp.) were as likely to be found seaward of the strandline as landward of it.

And there are many species involved. We recorded 108 taxa, 58 of which were identifiable to species. The most diverse site supported 30 species.

An interim report will appear in *Australian Zoology* in the proceedings from 'The Other 99%' conference held at the Australian Museum last December.

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Historical footnote

First Contacts: European Man Meets Tasmanian Mosquito at Adventure Bay, Bruny Island

27 January 1777
Snakes, Lizards & a Kind of the Guano are to be found here, Flies, Knatts, Musqeto's are Troublesome in the woods...
First Lieutenant John Gore, officer with James Cook on the *Resolution* (Beaglehole 1967; p. 58)

30 January 1777
Insects though not numerous are pretty various amongst which are Grasshoppers, Butterflys and several sorts of small moths finely variegated. There are two sorts of Dragon flies, Gad-flies, Camel flies, several sorts of spiders and Scorpions though the last are but rare. But the most troublesome were Muskito's and a large black Ant whose bite is almost intolerable for the short time it lasts, and the Muskitos though not very numerous make up that deficiency by the severity of their venomous proboscis.
Surgeon William Anderson of the *Resolution* (Beaglehole 1967, p. 794)

24 February 1792
A musquito was scarce to be seen even in the Swamps and the Flys were not troublesome as in hot weather, when both the one and the other are scarcely bearable.
Captain William Bligh of the *Providence* (Giblin 1928, p. 96).

References:

Beaglehole, J.C. 1967. *The Journals of Captain James Cook on His Voyages of Discovery. The Voyage of the* Resolution *and* Discovery *1776-1780* (2 vols.). Cambridge: published for the Hakluyt Society by the University Press.

Giblin, R.W. 1928. *The Early History of Tasmania. The Geographical Era 1642–1804.* London: Methuen and Co.

Around the traps

Queen Victoria Museum and Art Gallery

The Malacology section of the Department of Zoology at the Queen Victoria Museum continues to be busy and is progressing on several fronts. Brian Smith is continuing with the curation of the collection and the provision of identification services to several research projects, instrumentalities and the general public. With the help of data entry by Margaret Pattison, the registration of the collection is progressing well with nearly 15,500 species lots of molluscs registered. On a recent visit to the Museum of Victoria, Brian obtained identified exchange material including several lots of species not so far represented in the QVM collections. The aim is to obtain authenticated material of as many of the species described from Tasmania as possible — thus establishing as complete a coverage as possible of Tasmanian species in the reference collection. To this end, work is continuing on a revised checklist of all Tasmanian molluscs. This work, which was started by Ron Kershaw several years ago, will hopefully be finished this calendar year.

By far the most important happening in the world of Malacology in Australia this year was the publication in January of the *Fauna of Australia Volume 5 — Mollusca; the Southern Synthesis*. This is the long-awaited work that will provide the basic reference for all mollusc work in Australia for the next 10 years and beyond. Brian and Ron have been waiting for some time to have this available as the basic taxonomic framework for the Tasmanian list. They were both authors of a number of sections in the Fauna volume. Brian is planning to attend the First World Malacological Congress to be held in Washington D.C. this coming July. He is currently putting the finishing touches to his first issue of the journal *Molluscan Research* as editor. This will hopefully be ready by the end of April, after which he immediately starts on the second issue for 1998.

The malacological reference library at the QVM is also progressing well with a recent addition of three large boxes of old books and journals, including several volumes of the *Proceeedings of the Malacological Society of London* and some volumes of Tryon's *Manual of Conchology* — all on long-term loan from the Marine Research Group of Victoria. If anyone has need of a malacological reference, it might be worth trying the QVM, as we are starting to get a fairly respectable research library together.

Brian Smith

Tasmanian Museum and Art Gallery

It has been an unusually hectic summer in Hobart, due to all the festivities around the wharves for two months. Liz Turner was on leave for a few weeks, leaving Roger Buttermore to hold the fort for the Invertebrate Zoology Section. The warm-to-hot weather and additional people in town produced more enquiries than usual and kept him rather busy. Liz attended 'The Other 99%' Conference in Sydney last December. It was very encouraging for invertebrate research that so many Tasmanians attended. (The Jan.17/18th Hobart bushfires came a bit close to Liz's house for comfort, but a bottle of champagne worked wonders internally). Roger is preparing for his Churchill Fellowship bumblebee research trip to Europe, Canada and New Zealand, and has agreed to write a short report for this Newsletter on his return.

Liz Turner

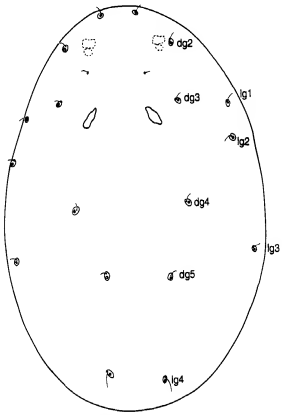
Forestry Tasmania

Monitoring for insect pests and fungal diseases is an integral part of growing trees. A survey of all our softwood and hardwood plantations is currently being conducted by Karl Wotherspoon. This survey is like an annual trip to the GP and should tell us about the general health of the plantation estate and any developing problems. At the same time routine monitoring for known insect pest species is conducted, for example chrysomelid leaf beetles and autumn gum moth. The value of the plantation estate is such that agents causing declines in growth increment must be detected at an early stage. Problems found are recorded, remedial measures taken when appropriate and an historical zonal profile developed. This will enable us to utilise the Forest Health Surveillance manpower most efficiently. To date some 38 insect species have been identified as feeding on or in *Eucalyptus nitens*. This eucalypt species constitutes the bulk of the hardwood plantation estate in Tasmania. Future surveys will no doubt increase the number of pest species which have the potential of damaging this valuable resource.

Dick Bashford

What is it?

Contributions to this feature are welcome but should be line illustrations, not photos.



What is it?
Answer next issue. Any guesses?

'Zoom In' - to the microscopic world

From 7th March to 14th June this year, the Tasmanian Museum and Art Gallery is hosting 'Zoom In', an exhibition presented by Questacon, The National Science and Technology Centre, Canberra, and sponsored by ICI Australia. 'Zoom In' revolves around Cyberscopes - six robotic microscopes enable the visitor to 'zoom in' and see specimens at magnifications from 5 to 380 on a monitor. Information about the specimens appears on an adjacent monitor. Inside the cyberscopes are fur and feathers, 'glitz and bits' (steel wool, glitter, string etc.), moulds and mushrooms, printing techniques (eg. stamps), human parasites (leeches, ticks and tapeworms), and the evolution of living things, which range from very simple hydra to tiny snails, a wasp and a snake.

Amongst other hands-on features in the exhibition are two binocular microscopes which give an excellent three-dimensional view of set objects, or anything the visitor wishes to bring, various collections of lenses to make your own microscope, and a fishbowl magnifier. A video camera gives close up views of any objects on a monitor, and a touch-screen computer program developed by CSIRO includes electron microscope pictures and interesting facts about insects.

The Tasmanian Museum and Art Gallery has added to the exhibition in a number of ways. Mr John Walch, of 'Walch Optics', has lent his magnificent collection of historical microscopes, going back to the early 1800s. He has also lent several up-to-date specialised microscopes, including a polarised light unit, and has provided Leica pamphlets including information on state-of-the-art microscopy equipment. Digitally scanned photographs of historical microscopes are presented in poster form to show the amazing development of magnification.

Demonstrations will be given by the museum's Invertebrate Zoology Section using microscope, video, TV monitor and computer link-ups. Any object placed under the microscope can be digitally captured and stored on computer in seconds, and if needed, emailed to anywhere in the world. Digital capture is a must for any internationally aspiring invertebrate zoologist. Images taken with the museum's equipment will be displayed as part of the exhibition.

So whether you are a visitor to Hobart, or a Hobart resident, come to the Tasmanian Museum and find your level of microscopy!